CLAIMS:

1. A method of forming a metal layer on a substrate, the method comprising:

pre-treating the substrate by exposing the substrate to excited species in a plasma;

exposing the pre-treated substrate to a process gas containing a metal-carbonyl precursor; and

forming a metal layer on the pre-treated substrate by a chemical vapor deposition process.

2. The method according to claim 1, wherein the substrate comprises a semiconductor substrate, a LCD substrate, or a glass substrate.

3. The method according to claim 1, wherein the pre-treating comprises:

creating a plasma from a pre-treatment gas including H_2, N_2, NH_3, He, Ne, Ar, Kr, or Xe or a combination of two or more thereof; and

exposing the substrate to excited species in the plasma.

4. The method according to claim 3, wherein the creating further comprises energizing an inductive coil and/or a substrate holder.

5. The processing system according to claim 4, wherein the energizing comprises applying RF power between about 500 W and about 3,000 W at a frequency between about 0.1 MHz and about 100 MHz to the inductive coil and/or applying RF power between about 0 W and about 2,000 W at a frequency between about 0.1 MHz and about 100 MHz to the substrate holder.

6. The method according to claim 3, wherein the creating further comprises flowing the pre-treatment gas at a gas flow rate between about 1 sccm and about 1,000 sccm.

7. The method according to claim 3, wherein the creating further comprises providing a pre-treatment gas pressure between about 0.3 mTorr and about 3,000 mTorr.

8. The method according to claim 1, wherein the pre-treating further comprises providing a substrate temperature between about –30° C and about 500° C.

9. The method according to claim 1, wherein the pre-treating comprises exposing the substrate to excited species in a plasma for between about 5 seconds and about 300 seconds.

10. The method according to claim 1, wherein the process gas comprises $W(CO)_6$, $Ni(CO)_4$, $Mo(CO)_6$, $Co_2(CO)_8$, $Rh_4(CO)_{12}$, $Re_2(CO)_{10}$, $Cr(CO)_6$, or $Ru_3(CO)_{12}$ or a combination of two or more thereof.

11. The method according to claim 1, wherein the process gas comprises a metal-carbonyl precursor and H_2, N_2, He, Ne, Ar, Kr, or Xe, or a combination of two or more thereof.

12. The method according to claim 1, wherein the exposing includes flowing the process gas at a gas flow rate between about 10 sccm and about 3,000 sccm.

13. The method according to claim 1, wherein the exposing includes flowing the metal-carbonyl precursor at a gas flow rate between about 0.1 sccm and about 200 sccm.

14. The method according to claim 1, wherein the forming comprises forming a layer containing W, Ni, Mo, Co, Rh, Re, Cr, or Ru, or a combination of two or more thereof.

15. The method according to claim 1, wherein the forming further comprises heating the substrate to between about 250° C and about 600° C.

16. The method according to claim 1, wherein the forming further comprises heating the substrate to about 400° C.

17. The method according to claim 1, wherein the forming further comprises providing a process gas pressure between about 10 mTorr and about 5 Torr.

18. The method according to claim 1, wherein the chemical vapor deposition process comprises thermal chemical vapor deposition, atomic layer chemical vapor deposition, or plasma-enhanced chemical vapor deposition or any combination thereof.

19. The method according to claim 1, wherein the pre-treating, exposing, and forming are carried out in at least one processing system.

20. A method of forming a tungsten layer on a substrate, the method comprising:

pre-treating the substrate by exposing the substrate to excited species in a plasma, wherein the plasma is formed from a pre-treatment gas containing H_2, N_2, NH_3, He, Ne, Ar, Kr, or Xe or a combination of two or more thereof;

exposing the pre-treated substrate to a process gas containing a $W(CO)_6$ precursor; and

forming a tungsten layer on the pre-treated substrate by a thermal chemical vapor deposition process.

21. A processing tool for forming a metal layer, comprising:

a transfer system configured for transferring a substrate within the processing tool;

at least one processing system configured for pre-treating a substrate by exposing the substrate to excited species in a plasma and exposing the pre-treated substrate to a process gas containing a metal-carbonyl precursor to form a metal layer on the pre-treated substrate in a chemical vapor deposition process; and

a controller configured to control the processing tool.

22. The processing tool according to claim 21, wherein the substrate comprises a semiconductor substrate, a LCD substrate, or a glass substrate.

23. The processing tool according to claim 21, wherein the at least one processing system contains a plasma created from a pre-treatment gas containing H_2, N_2, NH_3, He, Ne, Ar, Kr, or Xe or a combination of two or more thereof, the substrate being exposed to excited species in the plasma.

24. The processing tool according to claim 23, wherein the at least one processing system includes a plasma source configured to create the plasma.

25. The processing tool according to claim 24 wherein the plasma source includes an inductive coil and/or a substrate holder.

26. The processing tool according to claim 25, wherein the plasma source is configured for applying RF power between about 500 W and about 3,000 W at a frequency between about 0.1 MHz and about 100 MHz to the inductive coil and/or applying RF power between about 0 W and about 2,000 W at a frequency between about 0.1 MHz and about 100 MHz to the substrate holder.

27. The processing tool according to claim 23, wherein the at least one processing system comprises a gas delivery system configured to flow the pre-treatment gas at a gas flow rate between about 1 sccm and about 1,000 sccm.

28. The processing tool according to claim 23, wherein the at least one processing system provides a pre-treatment gas pressure between about 0.3 mTorr and about 3,000 mTorr.

29. The processing tool according to claim 21, wherein the at least one processing system provides a substrate pre-treating temperature between about –30° C and about 500° C.

30. The processing tool according to claim 21, wherein the at least one processing system exposes the substrate to excited species in a plasma for between about 5 seconds and about 300 seconds.

31. The processing tool according to claim 21, wherein the process gas comprises $W(CO)_6$, $Ni(CO)_4$, $Mo(CO)_6$, $Co_2(CO)_8$, $Rh_4(CO)_{12}$, $Re_2(CO)_{10}$, $Cr(CO)_6$, or $Ru_3(CO)_{12}$ or a combination of two or more thereof.

32. The processing tool according to claim 21, wherein the process gas comprises a metal-carbonyl precursor and H_2, He, Ne, Ar, Kr, or Xe or a combination of two or more thereof.

33. The processing tool according to claim 21, wherein the at least one processing system comprises a gas delivery system which causes the process gas to flow at a gas flow rate between about 10 sccm and about 3,000 sccm.

34. The processing tool according to claim 21, wherein the at least one processing system comprises a gas delivery system which causes the metal-carbonyl precursor to flow at a gas flow rate between about 0.1 sccm and about 200 sccm.

35. The processing tool according to claim 21, wherein the at least one processing system forms the metal layer containing W, Ni, Mo, Co, Rh, Re, Cr, or Ru or a combination of two or more thereof.

36. The processing tool according to claim 21, wherein the at least one processing system heats the substrate to between about 250° C and about 600° C while forming the metal layer.

37. The processing tool according to claim 21, wherein the at least one processing system heats the substrate to about 400° C while forming the metal layer.

38. The processing tool according to claim 21, wherein at least one processing system provides a process gas pressure between about 10 mTorr and about 5 Torr.

39. The processing tool according to claim 21, wherein the chemical vapor deposition process comprises thermal chemical vapor deposition, atomic layer chemical vapor deposition, or plasma-enhanced chemical vapor deposition or any combination thereof.

40. The processing tool according to claim 21, wherein the at least one processing system includes only one processing system.

41. The processing tool according to claim 21, wherein the at least one processing system includes at least two processing systems.

42. The processing tool according to claim 24, wherein the plasma source comprises a remote plasma source, an inductive coil, a plate electrode, an antenna, an ECR source, a Helicon wave source, or a surface wave source or any combination of two or more thereof.